

## Claims

- [c1] 1. A method of preparing a whole wafer of semiconductor material, having opposed front and back sides with respective surfaces and having at least one electronic device, comprising the steps of:
- covering the frontside of the wafer with a whole wafer frontside substrate;
- supporting the whole wafer with a whole wafer support coupled to the whole wafer frontside substrate, with the whole wafer frontside substrate protecting said at least one electronic device;
- said whole wafer including a whole wafer substrate having an initial thickness and which includes said whole wafer backside;
- thinning the whole wafer substrate, reducing its thickness to expose a new whole wafer backside surface at the backside of the whole wafer; and
- removing the whole wafer frontside substrate, exposing said at least one electronic device while maintaining the attachment of the whole wafer backside substrate to the whole wafer backside surface to strengthen and rigidify the whole wafer.
- [c2] 2. The method of claim 1 further comprising:
- providing a whole wafer backside substrate; and
- attaching the whole wafer backside substrate to at least a portion of the whole wafer backside surface to strengthen and rigidify the whole wafer.
- [c3] 3. The method of claim 2 further comprising the step of polishing the backside of the whole wafer prior to attaching the whole wafer backside substrate.
- [c4] 4. The method of claim 1 further comprising the steps of providing an inspection carrier and attaching the inspection carrier to the wafer to support the wafer for access of inspection instruments to both the frontside and the backside of the whole wafer.
- [c5] 5. The method of claim 1 wherein the step of thinning the whole wafer substrate comprises grinding the whole wafer substrate to expose the new whole wafer backside surface.
- [c6] 6. The method of claim 5 wherein the step of thinning the whole wafer

substrate comprises grinding the whole wafer substrate to expose the new whole wafer backside surface using full pad fixed abrasive grinding.

- [c7] 7. The method of claim 5 wherein the step of grinding the whole wafer substrate includes providing a backside grinder with a grind chuck and securing the whole wafer to the grind chuck.
- [c8] 8. The method according to claim 7 wherein the grind chuck includes a vacuum chuck for securing the wafer using vacuum forces.
- [c9] 9. The method of claim 2 wherein the whole wafer backside substrate is comprised of substantially transparent material and said step of attaching said whole wafer backside substrate to said whole wafer backside surface maintains the transparency of the whole wafer backside substrate so as to allow substantially transparent visual observation of said at least one electronic device from the backside of the wafer.
- [c10] 10. The method of claim 9 further comprising the step of performing failure analysis by inspecting the wafer backside utilizing emission microscopy to detect defects in said at least one electronic device which emits light.
- [c11] 11. The method of claim 2 wherein the step of attaching said backside substrate to said whole wafer backside surface comprises attaching said backside substrate with an adhesive.
- [c12] 12. The method of claim 2 wherein the step of attaching said backside substrate to said whole wafer backside surface comprises attaching said backside substrate with a substantially translucent adhesive.
- [c13] 13. The method of claim 2 wherein the step of attaching said backside substrate to said whole wafer backside surface comprises attaching said backside substrate with a substantially transparent adhesive.
- [c14] 14. The method of claim 13 wherein the adhesive is UV curable and said method further comprises the step of UV curing the adhesive.
- [c15] 15. The method of claim 1 wherein the step of attaching said backside substrate

to said whole wafer backside surface comprises attaching said backside substrate with a substantially opaque adhesive.

[c16] 16. The method of claim 1 wherein the step of supporting with said whole wafer support comprises engaging the edge of said whole wafer with an edge-frame holder to provide handling strength after backside thinning.

[c17] 17. The method of claim 1 wherein said thinning step comprises etching the backside of said whole wafer using focused ion-beam etching techniques.

[c18] 18. The method of claim 1 wherein the step of covering the frontside of the wafer with a whole wafer frontside substrate comprises attaching the whole wafer frontside substrate to the frontside of the wafer with an adhesive.

[c19] 19. The method of claim 18 further comprising the step of cleaning the frontside of the wafer after removing the whole wafer frontside substrate.

[c20] 20. The method of claim 2 wherein the new whole wafer backside surface has a preselected size and the whole wafer backside substrate is sized with a smaller size and the step of attaching comprises attaching the whole wafer backside substrate to a preselected portion of said new whole wafer backside surface.

[c21] 21. The method of claim 1 wherein said whole wafer frontside substrate is substantially rigid.

[c22] 22. The method of claim 1 wherein said whole wafer frontside substrate is substantially flexible.

[c23] 23. The method of claim 1 wherein said whole wafer frontside substrate is vacuum-porous.

[c24] 24. A method of preparing a whole semiconductor wafer having opposed front and back sides with respective surfaces and having at least one electronic device, comprising the steps of:  
covering the frontside of the wafer with a whole wafer frontside substrate;  
supporting the whole wafer frontside substrate in a vacuum chuck, with the whole wafer frontside substrate protecting said at least one electronic device;

said whole wafer including a whole wafer substrate having an initial thickness and which includes said whole wafer backside;

thinning the whole wafer substrate, reducing its thickness by grinding the wafer substrate to expose a ground surface at the backside of the whole wafer;

polishing the backside of the whole wafer to provide a new whole wafer backside substrate surface;

attaching the whole wafer backside substrate to the new whole wafer backside surface to strengthen and rigidify the whole wafer; and

removing the whole wafer frontside substrate, exposing said at least one electronic device while maintaining the attachment of the whole wafer backside substrate to the whole wafer backside surface to strengthen and rigidify the whole wafer.